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ARTICLE XII.

Notice of Fossil Bones found in the Tertiary Formation of the State of Louisiana. By Richard Harlan, M.D., &c. Read October 19. 1832.

IN conformity with a resolution recently passed by this Society, requesting me to describe the osteological fossil remains presented by Judge Bry, I have the honour to offer the following observations for publication in their Transactions. The fossils consist of several fragments of vertebræ, and one of immense size nearly perfect; together with specimens of the soil, and several osteological fragments too much mutilated to offer any descriptive characters.

For the local history of these fossils we are indebted to the following letter from the donor, addressed to our venerable President, Mr Duponceau.

Philadelphia, July 12, 1832.

Dear Sir,

I have the honour to present to you, for the Society over which you preside, some fossil bones, found on the Ouachita* river, in the state

* As I spell the word Ouachita differently from the apparently adopted mode, it may not be amiss to explain why I think that my orthography should be retained. The etymology of the word is in one respect descriptive of the country. The word Ouachita is composed of two Choctaw words; to wit, *ouac*, a buffalo, a cow, horned cattle in general, and *chito*, large, pronounced *tchito*, bearing lightly on the initial *t*. It meant the country of large buffaloes, numerous herds of those animals having formerly covered the prairies of Ouachita. All the names (now translated into French) of *River aux Bœufs*, *Bayou Bœuf*, have the same origin. These animals have disappeared before civilization, with the Indian tribes, whose principal

of Louisiana, at a distance (south) of about fifty miles by land, and one hundred and ten by water from the town of Monroe, in the parish of Ouachita, and in lat. $31^{\circ} 46'$ or $48'$.

I regret that my very limited knowledge does not permit me to add to this offer such a dissertation on the subject as would be useful or even agreeable. A scientific memoir cannot be expected from one who has now spent the last thirty years of his existence literally in the remotest forests of Louisiana, whose life has during that long period been entirely devoted to agricultural pursuits, and who has consequently been deprived of all means of keeping pace with the progress of science; yet as I feel that it may be necessary to make you acquainted, as far as lies in my power, with the locality of these bones, I beg leave to submit the following observations.

It would be useless to offer more than a few casual remarks on the geology of Louisiana, which is better known to the Philosophical Society than to myself. That part of the state, beginning at the foot of the highlands of Bâton Rouge, on the eastern side of the Mississippi, and at the hills in the parish of Cataouta to the sea, is evidently soil of comparatively recent formation. You are probably acquainted with the character of the different strata on which rests the lower part of Louisiana. A description of them has been published as they occur on the Bayou* St John, near the city of New Orleans, where

support they formed. They never remain long within hearing of the repeated strokes of the axe, or of the voice of the white man. Nothing is left to remind us of them at *Ouachita* but the sound of this name, which may serve to keep in remembrance the fact of their former undisturbed possession of the country. The common orthography, *Washita*, destroys this allusion and means nothing in itself. By retaining the mode of spelling which I have adopted, it may serve to show how languages the most remote may receive the phraseology of one another.

The first settlers at Ouachita were French hunters, who adopted, with that facility peculiar to their nation, not only the Indian mode of living, but, in some instances, their expressions. Thus they found the country named *Big Buffalo*, and they marked the different epochs of their lives by such expressions as these:—*l'année de la grande eau* (1798); and *l'année de la grande ourse* (1810), when thousands of bears crossed the country, emigrating towards the west.

* As the most important point in making ourselves well understood, is to attach to words a permanent meaning, conveying at once and correctly the ideas we wish to express, I beg leave to observe that I understand the word *bayou* to mean a stream which has little or no current; such as the *Bayou de Siard*, the *Bayou de la Mâchoire a l'Ours*, which are

an enterprising gentleman (Mr Elkins) undertook to bore for good water. He reached to the depth of two hundred and twelve feet, but endeavoured in vain to bore deeper. At that depth the soil appears to be of the same nature as the deposit now made by the Mississippi, the intermediate strata being various; but no shells were discovered except fragments of some *bivalvæ*, exactly similar to those now found in the Bayou St John. Part of a crab was brought up by the auger, at a depth of one hundred and sixty feet; and, if my memory serves me aright, a piece of a buck's horn was also found.

The hills, beginning at Cataouta, extend north to the Arkansas river, and west to Red river, whence they spread to the Sabine. Through that tract of country are interspersed overflowed lands, varying in extent according to the magnitude of the creeks, of which they form the banks at low water, and which flow over them at high water. In these hills very few ores are found except those of iron, which are abundant in two different places; but no measures have yet been taken to ascertain their value. The highest of the hills do not exceed eight hundred feet above high water mark; and in many places they dwindle into gently rolling ground. These hills appear to be of a much more ancient formation than the lower section of Louisiana. No rocks, however, enter into their composition; but a few sandy stones and pebbles, nearly all *siliceous*, are occasionally seen scattered on their summits, or in the beds of the numerous creeks fed by springs issuing from them.

Sea shells are discovered in several places; I found them on the highest ridge which divides the waters running into Red river from the tributary streams of the Ouachita. The tract, by far the richest in calcareous substances, is the one within the limits where fossil bones have been found, extending about fifteen miles from north to south, and probably ten or twelve from east to west. Several years ago, while rambling among these hills, I met with a small creek, the banks

hardly any thing more than natural drains to the adjacent low lands. A *creek* I conceive to be a small stream running through the hills and highlands with a brisk and continued current, and emptying itself into the bayous, rivers, or overflowed lands. These two expressions are thus generally used in the upper parts of Louisiana.

of which are in some places thirty feet high, in which I found many different species of sea shells, among others, *pectenites*, *belemnites*, &c. At the same time, my attention was attracted by a quantity of *cornua ammonis*, the largest of which did not exceed an inch and a half in diameter, while many were much smaller.

The hill, in which the bones herewith presented were found, is within the limits above described, at a distance of not more than two hundred yards from the Ouachita river. About three years ago, after the occurrence of a long spell of rainy weather, a part of the hill slid down near to the water's edge, and thereby exposed twenty-eight of these bones, which had been until then covered by an incumbent mass of earth about forty feet thick. They were imbedded in a bank of sea marl, a specimen of which is added to the bones, as well as of the calcareous spar and *talc* also found in the same hill. I followed a horizontal vein of this marl, five or six inches thick, which I traced to a distance of about forty feet, when it sinks into the valley under an angle of from twenty-five to thirty degrees. It appeared to have effloresced where it had been long exposed to the influence of the atmosphere.

When these bones were first seen, they extended in a line, which, from what the person living near the place showed me, comprised a curve, measuring upwards of four hundred feet in length, with intervals which were vacant. The person referred to destroyed many of the bones by employing them instead of andirons in his fire place, and I saved what remained from the same fate. I think, however, that a great many more bones belonging to the same animal are yet covered, and will gradually appear, as the soil and marl shall be washed off by the rain.

If I might presume to express an opinion as to the animal to which these bones belong, I should venture to say that they were part of a sea monster. The piece having the appearance of a tooth, which I gathered myself on the spot, may assist in determining that point. To you, Mr President, and to your learned colleagues, who are so fully adequate to the task, I cheerfully relinquish the solution of this problem, as well as the determination of the epoch of our globe when the

animal existed. Accept, my dear sir, the expression of my great regard for yourself, and of my sincere wishes for the prosperity of the useful institution over which you preside.

Your friend and obedient servant,

H. BRY.

P. S. DUPONCEAU, Esq.

President of the Philosophical Society, Philadelphia.

The geological formation in which these bones occur is evidently tertiary, similar to that extensive belt which characterizes our Atlantic borders. The piece of "sea-marl" alluded to in the above letter, is a conglomerate mass of small marine shells, consisting principally of an extinct species of *CORBULA*, about to be described by Mr T. Conrad, who has met with a similar formation, including the same shells, in Alabama. Most of these shells are comminuted; a few however are perfect. On the upper surface of the mass, there remains a stratum of clay, half an inch in thickness, inclosing pieces of crystallized carbonate of lime. The portion noticed by Mr Bry as displaying the appearance of a tooth, does in reality possess considerable resemblance in size and form to the teeth of some of the fossil Sauriens; but, on closer inspection, it is recognizable as a portion of the cast of a *PINNA*, with some of the shell still remaining attached to its base.

The principal fossil which forms the subject of this paper, consists of a vertebra of enormous dimensions, possessing characters which enable us to refer it to an extinct genus of the order "Enalio-Sauri" of Conybeare, which includes numerous extinct genera of marine lizards or crocodiles, generally possessing gigantic proportions, which have hitherto been found only in the sub-cretaceous series, from the *lias* up to the weald clay inclusive, in England, France, and Germany, and in the supposed equivalent formations in North America. The animal to which the present remnant belonged, existed at a period more recent than that of any of its congeners hitherto discovered; the formation in which it occurs being generally referable to a geological epoch more recent than any of the oolitic series.

We have compared our fossil with the following genera:—*Mososaurus*, *Geosaurus*, *Megalosaurus*, *Iguanodon*, *Ichthyosaurus*, and *Ple-*

siosaurus; from all of which it appears to be generically distinct; though it bears a closer analogy to the vertebræ of the last named species than to any other. The length of the axis of the bone is twice its diameter, being fourteen inches long and seven inches broad. Its sides are slightly concave in the middle, and the weight of the single vertebra is forty-four pounds. Allowing this individual to possess as many vertebræ as the *Plesiosaurus*, that is sixty-six, without those of the tail, the weight of the whole fossil skeleton may be fairly estimated as exceeding two tons; even supposing each vertebra to weigh only thirty pounds instead of forty-four, and calculating the weight of the head, extremities, pelvis, and tail to be collectively but a little heavier than the spine alone.

Judging from the position and descending obliquity of the transverse apophyses, and the small size of the canal for the spinal marrow, this vertebra must be referred to the posterior part of the column, most probably to the lumbar region. This opinion is strengthened by the coalition of the two foramina or fossæ, which characterize the *inferior* aspect of the vertebræ of the *posterior* part of the column in the spinal bones of the *Plesiosaurus*,* in which respect these portions of the two fossils closely resemble each other. They are also similar in the *planes* of the articulating surfaces of the bodies of the vertebræ; but our fossil differs totally from the same portion of the *Plesiosaurus* in its proportions, the vertebræ of the latter being broader than long, whereas the present specimen is twice as long as it is broad. All the superior apophyses of the *Plesiosaurus* are attached by suture to their bodies; but there are no marks of such a structure in our fossil. In the *Plesiosaurus*, the ribs are articulated with the distal extremities of the transverse processes by a single tubercle. Reasoning analogically, the same arrangement may be referred to the species under consideration, the size of which is immensely superior to that of any of the Saurian or Cetaceous tribe whatever. Judging from relative proportions, the *Megalosaurus* did not attain to more than forty feet in length; the *Iguanodon* of Mr Mantell did not exceed sixty feet; but the individual

* All the vertebræ of the *Plesiosaurus* are characterized by two foramina on their inner aspect, which approach each other as we descend the column, until at last they form but one hole with a septum.

now produced could not have been less than from eighty to one hundred feet long. According to the statement of judge Bry, there were four hundred feet in extent, nearly in a linear direction, marked by these fossils in the soil, which undoubtedly include the remains of several individuals. If future discoveries of the extremities (paddles) and of the jaws and teeth of this reptile, should confirm the indications I have pointed out, we may suppose that the genus to which it belonged, will take the name, by acclamation, of "**BASILOSaurus**."